stated in the step 4 of the first embodiment.

In the polymethyl siloxane film formed by the method of the present embodiment, advantageous effect similar to that according to the first embodiment is attained. In addition, the present embodiment is more excellent than the first embodiment in view of productivity because the number of steps is smaller than that of the first embodiment by two. Further at least one parameter can be changed as the first embodiment and similar effects can be attained. For instance the temperature can be changed from 200℃ to 400℃.

(Fourth Embodiment)

Now, a method for manufacturing a semiconductor device according to a fourth embodiment of the present embodiment will be described here. The present embodiment is different from the first embodiment in view of the method for forming an interlayer insulation film 3. An outline of the above process is given below (steps 1 to 3).

Step 1: A vanish is applied on a semiconductor substrate 1 by using a spin coating technique.

Step 2: An electron beam is irradiated on the semiconductor substrate 1 while the semiconductor substrate 1 is heated, and the interlayer insulation film 3 is formed.

Step 3: A heat treatment 400℃, two minutes is

applied to the substrate.

The above process will be described in more detail. First, as in the first embodiment, the step 1 is executed, and a coat film is formed (step 1).

Next, the above semiconductor substrate is placed on a hot plate held at 200℃ in a nitrogen atmosphere under air pressure, the above coat film is irradiated with the electron beam, and an interlayer insulation film is formed (step 2). The above electron beam irradiation is carried out under a condition of 6 keV in the electron beam energy and 500 $\mu C/cm^2$ in irradiation quantity.

By a reason similar to that stated in the step 4 of the first embodiment, it is desirable that the substrate temperature be 200℃ or more and not more than 500℃ during heating in the step 2. By a reason similar to that stated in the step 4 of the first embodiment, it is desirable that the step 2 is carried out in an atmosphere and the oxygen concentration is restrained to not higher than 100 ppm.

In addition, according to experiment made by the inventors, it is found that the temperature of heat treatment in the step 3 is effective when the temperature is equal to or greater than that in step 2. In addition, it is found that the time of heat treatment in the step 3 is effective when the time is equal to or longer than that in the step 2.

By a reason similar to that stated in the step 4 of the first embodiment, it is desirable that the steps 2 and 3 be executed in non-reduced (normal) pressure atmosphere or in reduced pressure atmosphere in which the oxygen concentration is restrained to 100 ppm or less.

As characteristics of the polymethyl siloxane film formed by the method of the present embodiment, advantageous effect similar to that according to the first embodiment is attained.

Further, as in the second embodiment, the damage of an element or the like caused by the electron beam irradiation can be recovered by heat treatment of the step 3, whereby, for example, characteristics such as a leak current or a threshold voltage of a MOS type element can be improved. In addition, the present embodiment is more excellent than the second embodiment in view of productivity because the number of steps is smaller than that of the second embodiment by two. Further at least one parameter can be changed as the first embodiment and similar effects can be attained. For instance the temperature can be changed from 200℃ to 400℃.

(Fifth Embodiment)

FIGS. 4A to 4C are sectional view showing the steps of manufacturing a semiconductor device according to a fifth embodiment of the present invention.